

NASA TECH BRIEF

Ames Research Center

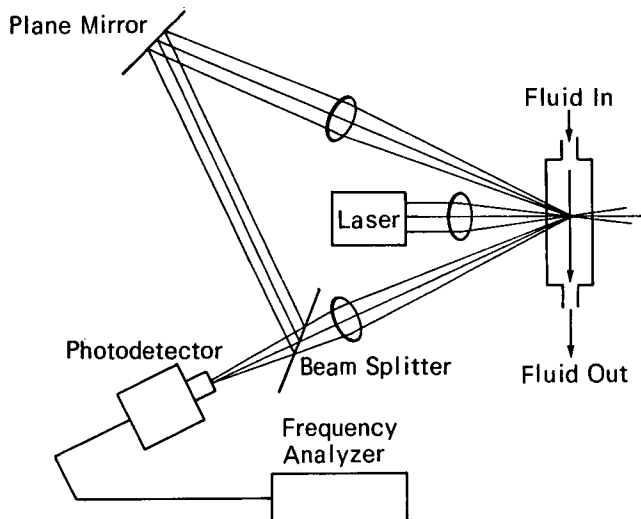


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Laser Doppler Instrument Measures Fluid Velocity Without Reference Beam

The problem

Measure the velocity of a fluid without inserting sensing devices into the fluid stream or utilizing a reference energy source.



The solution:

Focus a laser beam on the moving fluid and measure the Doppler shift in frequency which results when the radiation is scattered by particles either originally present in or deliberately injected into the moving fluid.

How it's done:

A laser beam is focused on a small area of the scattering medium. The light reflected from this area is viewed along two optical paths, and the field of view of each path is limited so that only the small area is imaged on a photodetector.

As shown in the figure, the laser beam is focused on the moving fluid. Lenses are symmetrically positioned about the laser beam in order to view the backscattered light from different angles. The scattered beam passing through one lens is directed onto a beam splitter which transmits a portion of the light to a photodetector. The beam through the second lens is reflected by a plane mirror onto the same beam splitter, which also reflects a portion of that beam to the photodetector. The Doppler-shifted optical beams are mixed at the photodetector to give an output which includes a periodic signal at the Doppler difference frequency of the beams. This difference frequency, which is detected by the frequency analyzer, is related to the velocity of the fluid stream in the chamber.

Notes:

1. The instrument may be applicable to measurements of air velocity in wind tunnels, relative air-speed of aircraft, cloud velocity, and liquid flow rate.
2. Related instruments are described in NASA Tech Briefs 66-10693 and 68-10349.
3. The following documentation may be obtained from:

National Technical Information Service
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.95)

Reference:

NASA-TN-D-4453 (N68-20375), Investigation of Air-Flow Velocity by Laser Backscatter

(continued overleaf)

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,547,540, issued December 15, 1970), and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to:

Patent Counsel
Mail Code 200-11A
Ames Research Center
Moffett Field, California 94035

Source: Fred H. Shigemoto and
Kent R. Bourquin
Ames Research Center
(XAC-10770)